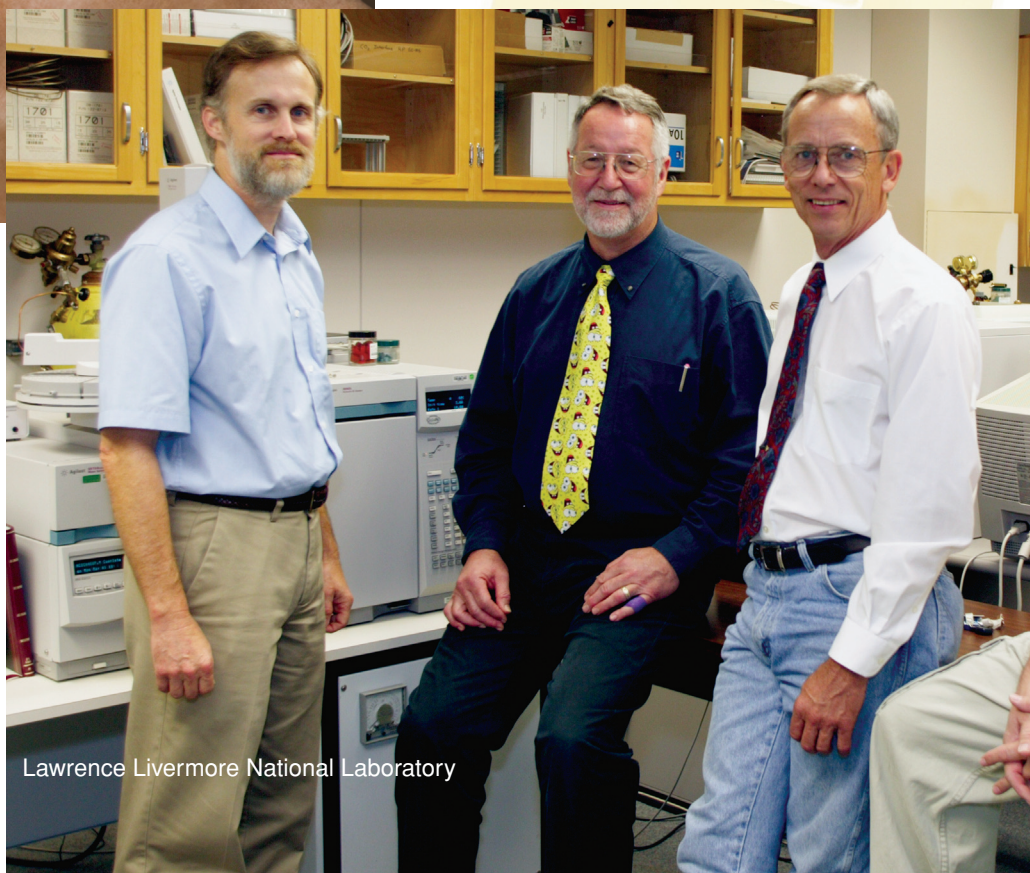
POCKET-SIZED TEST DETECTS

SECURITY forces throughout the world need detection tools that can quickly and accurately locate small amounts of explosives. Technology developed by Lawrence Livermore will provide emergency response, law-enforcement, and military personnel with an easy-to-use explosives detector small enough to carry in a shirt pocket. This technology, called E.L.I.T.E.™ (Easy Livermore Inspection Test for Explosives), is inexpensive and requires minimal training for deployment.

E.L.I.T.E. cards are particularly useful for screening vehicles, containers, and people for explosives residue. The 5- by 7.5-centimeter card weighs about an ounce, and test results are available immediately in the field. After a card has been used, it can be discarded without special handling.

The E.L.I.T.E. card technology was developed by a team of scientists and engineers from the Laboratory's Forensic Science Center (FSC) and Center for Energetic Materials. Led by FSC deputy director John Reynolds, the team won a 2006 R&D 100 Award for the new technology. The product, which also received a 2006 Excellence in Technology Transfer Award from the Federal Laboratory Consortium, is marketed by Field Forensics, Inc., of Florida. Since October 2005, when units became commercially available, Field Forensics has sold E.L.I.T.E. cards to many government agencies, including the Department of Homeland Security, New York State Police, Royal Canadian Mounted Police, and Queensland (Australia) Police.

The E.L.I.T.E.™ card is small enough to fit in a pocket, yet sensitive enough to detect trace amounts of up to 30 explosives.



Livermore members of the E.L.I.T.E.™ development team (from left to right): Randall Simpson, John Reynolds, J. Del Eckels, and Pete Nunes.

Lawrence Livermore National Laboratory

TRACE EXPLOSIVES

Inexpensive Cards with Built-in Simplicity

Each E.L.I.T.E. card is good for one test. To collect a sample, a user removes the swipe from the card, rubs it on a suspect area—a shoe, car door, or suitcase—and slides it back into the card. The user then ruptures two sealed ampoules that contain the developing chemicals. A few drops of the reagent flow onto the swipe through microchannels fabricated in the card's plastic case. Within a minute, an explosive trace, if present, will appear as a brightly colored spot on the white swipe.

The color and intensity of the spot indicate the type and concentration of the explosive found. Explosives generally show up as bright red or pink, so they are easy to distinguish from dirt and other stray substances. The chemical formulation used in E.L.I.T.E. cards can detect military and commercial explosives, such as C-4, Semtex, TNT, and derivatives, as well as inorganic explosives and propellants, such as ammonium nitrate and black powder. A used card requires no special handling and can be disposed of as regular waste.

The cost of detection technology is a critical issue for many security organizations, and E.L.I.T.E. delivers an affordable product. Cards cost $10 to $20 each; other commercially available screening systems can range from $40 to $7,500. But cost is not the only advantage. "We developed a reagent formulation with a dramatically improved shelf life," says Reynolds. "E.L.I.T.E. units have a much longer service life than comparable products." Similar screening products have an average shelf life of one year or less. Once in service, these detection tools remain effective for one to four months. The E.L.I.T.E. reagents, however, have an indefinite shelf life and do not have to be replaced frequently.

The E.L.I.T.E. card also has lower detection limits than other screening products and can detect more than 30 types of explosives and propellants. In addition, reagents are self-contained in each card, so users are never exposed to these chemicals. Other detection technologies typically store reagents in separate bottles, and users must spray the formula onto a swipe or otherwise apply it by hand. This approach not only exposes users to chemicals but also can be difficult to use in inclement weather.

Reynolds notes that other explosives detection kits can be cumbersome or require users to follow complicated procedures. "The E.L.I.T.E. card solves this problem, too," he says. "Instructions are printed right on the card, so user error is largely eliminated. Plus the engineered design dispenses the proper amount of chemicals each time."

Potential to Save Lives

E.L.I.T.E. cards operate effectively in harsh environments, so the technology could be adapted for military use, such as to screen materials in combat zones. Other applications include border inspections, airport and transit security, and decontamination verification.

The cards' potential to stem terrorism is also clear. "Explosives will continue to be a terrorist's weapon of choice as long as they are available in a usable form," says Reynolds. "E.L.I.T.E. cards provide security personnel with a fast, effective method to detect explosives and deter their use. These sensitive, robust explosives detectors offer an enormous potential for saving the lives of civilians and military and law-enforcement personnel."

—Ann Parker

Key Words: Easy Livermore Inspection Test for Explosives (E.L.I.T.E.™) card, explosives testing, R&D 100 Award.

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